

first location and a second location. In the end positions, which delimit the pivoting range, the first pivoted lever always faces towards one location or the other location. A second pivoted lever is mounted at the end of the first lever and driven in the opposite direction thereto and with a predetermined gear ratio thereto, for example, resulting from a fixed toothed wheel by means of a toothed belt and a further toothed wheel. A chip gripper is connected to the end of the second lever. The gear ratio of the two levers is matched to each other such that in both end positions, the two levers are in an extended position with respect to one another and the chip gripper is over the one location or the other location. The pivot planes of the levers are parallel to the planes of the chip carrier and/or of the substrate upon which the chips are mounted.

REMARKS

Upon entry of this amendment, which amends claims 15, 17, 18, 19, 20, 21, 22, 23, 24, 40, claims 15-40 remain pending.

In the October 25, 2002 Final Office Action, claims 15-40 were rejected under 35 U.S.C. § 112, first paragraph, because the specification allegedly does not reasonably provide enablement for seating the first pivoted lever at an opposing end on a second shaft. Claims 18, 20, 22 and 24, as well as claims dependent upon these claims, were rejected under 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at that time the application was filed, had possession of the claimed invention. Claims 15-40 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and

distinctly claim the subject matter which Applicant regards as the invention. Claims 15-40 were rejected under 35 U.S.C. 102(a) as being allegedly unpatentable over Parker ~~(US 5,934,147)~~ in view of Uehara et al ~~(US 5,584,647)~~. The claims have been amended where appropriate to address these rejections as discussed herein below.

Support for Amendments

The amendments to claim 15 and 40 are supported by the original specification, page 7, line 4-5.

The amendment to the paragraph beginning at page 7, line 19 is supported by the original figures 1, 2 and 5 which show that the belt runs from the first toothed wheel to the second toothed wheel which are located at opposing ends of the first pivoted lever, and by original claim 11. A person of ordinary skill in the art having the benefit of the originally filed specification, drawings and claims would clearly recognize that the intermediate toothed wheel which replaces the belt would be placed between the toothed wheels and therefore on the first pivoted lever.

No new matter has been introduced by any of these amendments.

Abstract

The abstract has been amended. A clean copy is attached at the end of this paper.

Claim Rejections - 35 U.S.C. § 112, First Paragraph

On page 3 of the Office Action, claims 15-40 were rejected under 35 U.S.C. § 112, first paragraph, allegedly because the specification does not reasonably provide

enablement for seating the first pivoted lever at an opposing end on a second shaft. With the amendment of claims 15 and 40, this issue has been resolved.

On page 3 of the Office Action, claims 18, 20, 22 and 24, as well as claims dependent upon these claims, were rejected under 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at that time the application was filed, had possession of the claimed invention. With the amendment of claims 18, 20 and 24, this issue has been resolved.

Claim Rejections - 35 U.S.C. § 112, Second Paragraph

On page 3 of the Office Action, claims 15-40 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. With the amendment of claims 1, 18, 20, 24 and 40, this issue has been resolved.

Accordingly, Applicant respectfully requests that the 35 U.S.C. § 112 rejections of these claims be withdrawn.

The 35 U.S.C. § 102(a) Rejections

Claims 15-40 were rejected under 35 U.S.C. 102(a) as allegedly being unpatentable over Parker (US 5,934,147) in view of Uehara et al. (US 5,584,647).

In the response to the last Office Action Applicant had briefly set forth the substance of the present invention as well as the difference to Uehara et al. (US

5,584,647). In this context, an important difference is that the levers of Uehara et al are rotated individually, i.e. each lever is rotated by its own drive, whereas Applicant's ~~invention has only a single drive for rotating the first lever and a coupling mechanism for~~ rotating the second lever simultaneously and continuously with the first lever. The result is that with Applicant's invention the second lever is automatically in an extended position with respect to the first lever when the first lever is in the first or second end position whereas this is clearly not the case with the apparatus of Uehara et al.

Parker (US 5,934,147) discloses a linkage arrangement comprising a first lever 14, a second lever 18 and a gripper 22. The linkage arrangement further comprises a first drive in the form of a pair of hydraulic rams for pivoting the linkage lever 14 (col. 7, lines 36-40), a second drive in the form of a hydraulic actuator 19 (col. 8, lines 44-48) for pivoting the second lever 18 and a third drive in the form of an actuator 23 (col. 7, lines 31-33) for rotating the gripper 22. The linkage arrangement further comprises a first orientation base 28, a second orientation base 33, and arms 30, 30', 35 and 35'. The purpose of these means is the enablement of two forms of rotations at each link pivot. These are direct actuation and rotation inherent from actuation of the preceding joint with the result that the rotary value required from anyone actuator is less, reducing actuator design difficulties (Col. 9, lines 55-59).

As with Uehara et al. the most important difference is again that two actuators are needed for rotating the levers of Parker, whereas Applicant's invention has only a single drive for rotating the first lever and a coupling mechanism for rotating the second lever simultaneously and continuously with the first lever. Although with Parker the rotation of the first lever 14 implies an inherent rotation of the second lever 18, the underlying

mechanism does not provide an automatism to bring the second lever automatically in an extended position with respect to the first lever when the first lever is in the first or second end position as this is the case with Applicant's invention.

The prior art cited against a patent application must be viewed without reading Applicant's teachings into the references. When prior art references must be selectively combined, as done here by the Examiner, to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself. Such a reason is lacking in this situation: Neither Uehara et al. nor Parker contain any suggestion or motivation to construct an apparatus with only one drive for enabling a simultaneous rotation of the first and second lever; the coupling between the first and second lever being such that the second pivoted lever is in an extended position with respect to the first pivoted lever when the first pivoted lever is in said first end position or said second end position. Or in the wording of amended claim 1: Neither Uehara et al. nor Parker contain any suggestion or motivation to construct an apparatus used as a component of a die bonder for placing a semiconductor chip on a substrate, comprising:

- a first pivoted lever seated at one end on a first shaft, said first shaft mounted equidistantly between a first location and a second location;

- a drive coupled to said first shaft for pivoting said first pivoted lever in alternating pivoting directions through an angle of pivoting between a first end position in which said first pivoted lever is directed toward said first location and a second end position in which said first pivoted lever is directed toward said second location;

a second pivoted lever seated at one end on said second shaft, a sum of lengths of said first and second pivoted levers equaling a distance from said first shaft to said first ~~location or said second location, said first and second pivoted levers pivoting in~~ horizontal planes;

a drive mechanism for rotating said second pivoted lever in an opposite pivoting direction and with a predetermined gear ratio with respect to said first pivoted lever, the drive mechanism coupling said first and second pivoted lever such that the second pivoted lever is in an extended position with respect to said first pivoted lever when the first pivoted lever is in said first end position or said second end position; and

a semiconductor chip gripper seated at an opposing end of said second pivoted lever.

Applicant respectfully traverses the U.S.C. §102(a) rejection of claims 15-40 and submits that the claims are allowable in view of the cited prior art.

Request for Entry of Amendment

Entry of this Amendment will place the application in better condition for allowance, or at the least, narrow any issues for an appeal. Accordingly, entry of this Amendment is appropriate and is respectfully requested.

Request for Allowance

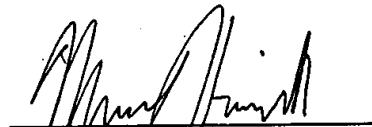
As each of the Examiner's rejections have been addressed herein, early favorable consideration of this Amendment is earnestly solicited and Applicant requests that the Examiner enter this amendment and pass claims 15-40 to issue.

If, in the opinion of the Examiner, an interview would expedite the prosecution of this application, the Examiner is invited to call the undersigned attorney at the number indicated below. ~~The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to Deposit Account No. 50-1698.~~

Respectfully submitted,

THELEN REID & PRIEST, LLP

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Marc S. Hanish
Reg. No. 42,626

Thelen Reid & Priest LLP
P.O. Box 640640
San Jose, CA 95164-0640
Telephone: (408) 292-5800
Facsimile: (408) 287-8040

“Version with Markings to Show Changes Made”

In the specification:

Please replace the paragraph beginning at page 7, line 19, with the following rewritten paragraph:

The second pivoted lever 12 is not carried along “passively” by the first lever 10, but instead is subject to being driven with a predetermined gear ratio relative to the first lever 10 and in the opposite direction to the direction of pivoting of the first lever 10. In accordance with the example shown, this drive is produced by means of a toothed belt 6 which loops around a fixed toothed wheel 5 coaxial to the shaft 4 and a toothed wheel 7 fitted onto the shaft 14 (instead of the toothed belt 6, an intermediate toothed wheel 50 mounted on the first lever 10 [12], which meshes with the toothed wheels 5 and 7, as shown in Fig. 6 [could be provided])). In this way the pivoting movements of the two levers 10 and 12 (pivoting angles ϕ_1 and ϕ_2) are coupled together in a particular way.

Please replace the paragraph beginning at page 10, line 21, with the following rewritten paragraph:

Fig. 7 shows an embodiment of a semiconductor mounting apparatus according to the invention, wherein the toothed belt is replaced by an intermediate toothed wheel.

Each chip 30 undergoes a rotation of 120° along the path from A to B. The wafer 35 must therefore correspondingly be orientated with the edges of the chip parallel and

perpendicular to Ea, and also the displacements of the wafer table 34 must naturally be orientated as shown by the arrows in Fig. 5.

Please amend claims 15, 17, 18, 19, 20, 21, 22, 23, 24, 40 as follows:

15. (Twice Amended) An apparatus used as a component of a die bonder for placing a semiconductor chip on a substrate, comprising:

a first pivoted lever seated at one end on a first shaft [and at an opposing end on a second shaft], said first shaft mounted equidistantly between a first location and a second location;

a drive coupled to said first shaft for pivoting said first pivoted lever in alternating pivoting directions through an angle of pivoting between a first end position in which said first pivoted lever is directed toward said first location and a second end position in which said first pivoted lever is directed toward said second location;

a second pivoted lever mounted by means of a second shaft located at another end of said first pivoted lever [seated at one end on said second shaft], a sum of lengths of said first and second pivoted levers equaling a distance from said first shaft to said first location or said second location, said first and second pivoted levers pivoting in horizontal planes;

a drive mechanism for rotating said second pivoted lever in an opposite pivoting direction and with a predetermined gear ratio with respect to said first pivoted lever, the drive mechanism coupling said first and second pivoted lever such that the second

pivoted lever is in an extended position with respect to said first pivoted lever when the first pivoted lever is in said first end position or said second end position; and

a semiconductor chip gripper seated at an opposing end of said second pivoted lever.

17. (Twice Amended) The apparatus according to claim 15 wherein said drive mechanism comprises:

a first toothed wheel coaxial to said first shaft;

a second toothed wheel coupled coaxially to said second shaft; and

a belt looped around and engaging said first and second toothed wheels.

18. (Twice Amended) The apparatus according to claim 15 [17] wherein said drive mechanism comprises: [an intermediate wheel.]

a first wheel coaxial to said first shaft;

a second toothed wheel coupled coaxially to said second shaft; and

an intermediate toothed wheel engaging said first and second toothed wheels.

19. (Twice Amended) The apparatus according to claim 16 wherein said drive mechanism comprises:

a first toothed wheel coaxial to said first shaft;

a second toothed wheel coupled coaxially to said second shaft; and

a belt looped around and engaging said first and second toothed wheels.

20. (Twice Amended) The apparatus according to claim 16 [19] wherein said drive mechanism comprises: [an intermediate wheel.]
a first toothed wheel coaxial to said first shaft;
a second toothed wheel coupled coaxially to said second shaft; and
an intermediate toothed wheel engaging said first and second toothed wheels.
21. (Twice Amended) The apparatus according to claim 17 wherein a gear ratio of said first toothed wheel and said second toothed wheel equals three.
22. (Twice Amended) The apparatus according to claim 18 wherein a gear ratio of said first toothed wheel and said second toothed wheel equals three.
23. (Twice Amended) The apparatus according to claim 19 wherein a gear ratio of said first toothed wheel and said second toothed wheel equals three.
24. (Twice Amended) The apparatus according to claim 20 wherein a gear ratio of said first toothed wheel and said second toothed wheel equals three.
40. (Once Amended) An apparatus for placing a semiconductor chip on a major surface of a substrate, comprising:

a first pivoted lever seated at one end on a first shaft [and at an opposing end on a second shaft], said first shaft mounted equidistantly between a first location and a second location; a drive coupled to said first shaft for pivoting said first pivoted lever in alternating

pivoting directions through an angle of pivoting between a first end position in which said first pivoted lever is directed toward said first location and a second end position in which said first pivoted lever is directed toward said second location;

a second pivoted lever mounted by means of a second shaft located at another end of said first pivoted lever [seated at one end on said second shaft], a sum of lengths of said first and second pivoted levers equaling a distance from said first shaft to said first location or said second location, said first and second pivoted levers configured to sweep through a plane parallel to the major surface of the substrate;

a drive mechanism for rotating said second pivoted lever in an opposite pivoting direction and with a predetermined gear ratio with respect to said first pivoted lever, the drive mechanism coupling said first and second pivoted lever such that the second pivoted lever is in an extended position with respect to said first pivoted lever when the first pivoted lever is in either said first end position or said second end position; and

a semiconductor chip gripper seated at an opposing end of said second pivoted lever.

Please amend the abstract to read as follows:

An [A “pick-and-place”] apparatus used as a component of a die bonder has a first pivoted lever driven in alternating directions of pivoting, the drive shaft of which is mounted centrally between a first location and a second location. In the end positions, which delimit the pivoting range, the first pivoted lever always faces towards one location or the other location. A second pivoted lever is mounted at the end of the first lever and driven in the opposite direction thereto and with a predetermined gear ratio thereto, for example, resulting from a fixed toothed wheel by means of a toothed belt and a further toothed wheel. A chip gripper is connected to the end of the second lever. The gear ratio [and the lengths] of the two levers is [are] matched to each other such that in both end positions, the two levers are in an extended position with respect to one another and the chip gripper is over the one location or the other location. The pivot planes of the levers [can be perpendicular or] are parallel to the planes of the chip carrier and/or of the substrate upon which the chips are mounted.